

# CS325 – attendance taking on moodle

The screenshot shows a Moodle attendance activity titled "Attendance cs325f21-a.sg". The activity is set to 6/10 and the time window is 1:30pm-4:50pm. It states that responses can be submitted from the DigiPen campus or from a remote location. A message asks users to confirm their attendance by selecting their individual section. Below this, a statement says "I am attending class today and my section is:" followed by a dropdown menu containing "cs325f21-a.sg". A note at the bottom indicates that results will not be published after the choice is made. At the bottom, there are "Save my choice" and "Remove my choice" buttons. The "Save my choice" button is highlighted with a red oval.

202001sg-Fall

Attendance cs325f21-a.sg 6/10 1:30pm-4:50pm

View 0 responses

Can be from the DigiPen campus or from a remote location.

Please confirm your attendance by selecting your individual section below

I am attending class today and my section is:

This is just a preview of the available options for this activity. You will not be able to submit your choice until Wednesday, September 8, 2021, 1:15 PM.

The results of this activity will not be published after you answer.

cs325f21-a.sg

Save my choice Remove my choice

Time window:  
1:15pm – 1:45pm

CS325  
USER INTERFACE AND USER EXPERIENCE DESIGN  
Week 5

Dr Frank Guan

Recap from last week

# User Analysis

- Identify characteristics of your target users
- Categorize your target users
- Use a persona to illustrate a user class
- How to do User Analysis?
  - Questionnaires
  - Interviews
  - Observation

# Task Analysis

- Essential parts
  - Goal
  - By whom?
  - Pre-conditions
  - Subtasks
  - ...
- How to do Task Analysis?
  1. Observation
  2. Interviews
  3. Ethnography
  4. Surveys & Questionnaires
  5. Competitive Product Review
  6. Documentation mining
  7. Data logging

# Task describing

1. Task Outlines and Narratives
2. Hierarchies & Network Diagrams
  - Hierarchical Task Analysis (HTA)
  - Entity-Relationship Diagrams
3. Flow Charts
4. Knowledge Based Analysis

# Domain Analysis

- Determine important things
  - User
  - Physical objects
  - Information objects
- Determine important relationships between the identified important things

# Agenda for this lecture

- Usability definition
- Dimensions of usability
- Guidelines of usability

# Usability Definition

# Now...

- You have defined your target application
- You have started user and task analysis
- Next, you are preparing to start the UI design
- BUT HOW?

# UI Are Hard to Design

- You are not the user
  - Most Software Engineering is about communicating with other programmes
  - UI is about communicating with users
- The user is always right
  - Consistent problems are the system's fault
- ...but the user is not always right, either
  - Users are not designers

# Factors that Affect User Experience

- **Useful:** your design should fulfill a need (functionality)
- **Usable:** your design must be easy to use (usability)
- **Desirable:** design elements (i.e. images) are used to evoke emotion and appreciation
- **Credible:** users lay trust on your design and believe what you tell them (someone continues using one brand product for life)
- **Findable:** content needs to be easily located and navigated (why there is always a “search” function in website/apps)

# Usability

Usability: How well users can use the system's functionality?

"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."

- ISO 9241-11

# Dimensions of Usability

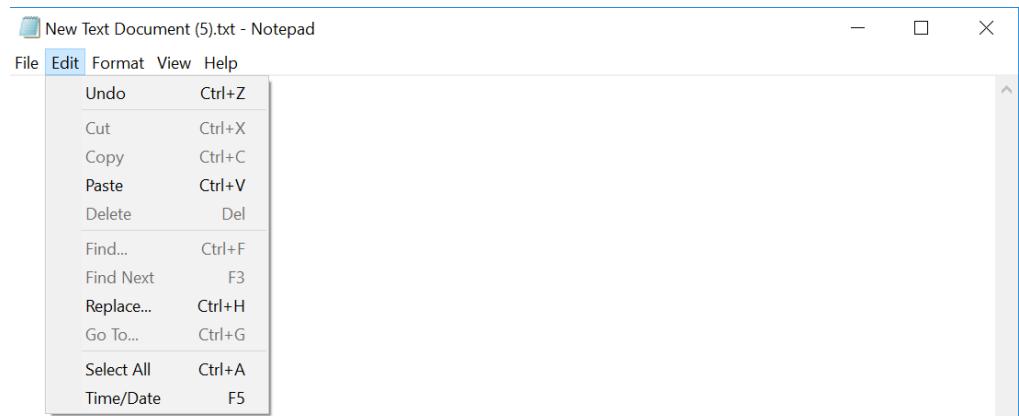
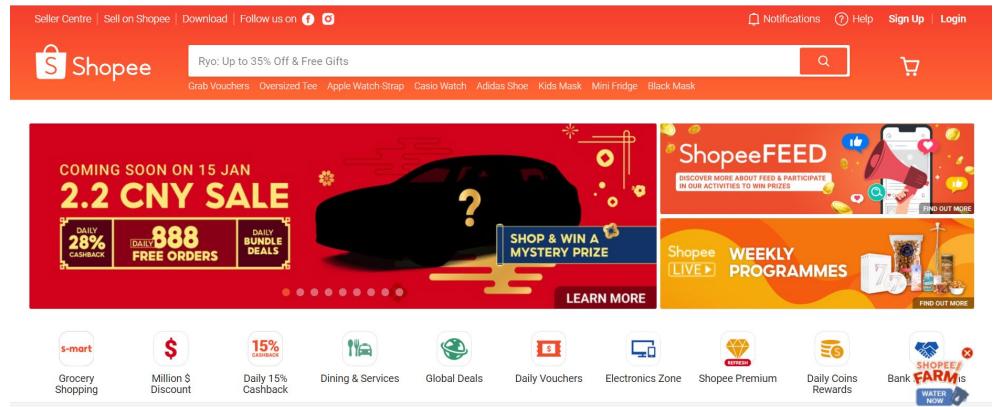
- **Learnability**
  - How easy is it for users to accomplish basic tasks the first time they encounter the design?
- **Visibility**
  - Is the state of the system visible?
- **Efficiency**
  - Once users have learned the design, how quickly can they perform tasks?
- **Flexibility**
  - How easy can user and the system exchange information?
- Errors and robustness
  - Are errors few and recoverable?
  - How to prevent users from making errors?
- **Memorability**
  - When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- **Satisfaction**
  - Is it enjoyable to use?

# Usability Dimensions Vary in Importance

- Depends on the user
  - Novice users need learnability
  - Infrequent users need memorability
  - Experts need efficiency
- But no user is uniformly novice or expert
  - Domain experience
  - Application experience
  - Feature experience

# Learnability - Predictability

- How easy is it for users to accomplish basic tasks the first time they encounter the design?
- Determining effect of future actions based on past interaction history
  - “I think that this action will do...”
  - System behavior is observably deterministic
- Operation visibility
  - user actions should be matched by a response
  - affordance/logical constraints should be used to indicate available actions:
    - e.g. grayed menu items



# Learnability - Synthesizability

- The ability of the interactive system to provide the user with an **observable and informative notification** about the operation state changes within the system.
  - “Can I tell why I am here based on what I have gone through?”
- Two aspects of synthesisability:
  - immediate honesty
  - eventual honesty
- A good example of this is the file management capabilities of Windows Explorer and the command line operations in DOS.
  - Moving a file from one folder to another is observable by the user in Windows.
  - However, carrying out the same operation in DOS provides no visual representation of the system's actions, in other words no immediate honesty.



```
sr-01624 3 % cp abc pqr/abc
cp: cannot create regular file 'pqr/abc': No such file or directory
sr-01624 4 %
```

# Learnability - Familiarity

- Matching users' expectations
- Does UI task relate real-world task or domain knowledge?
  - To anything user is familiar with?
  - Use of metaphors
  - Are there limitations on familiarity?



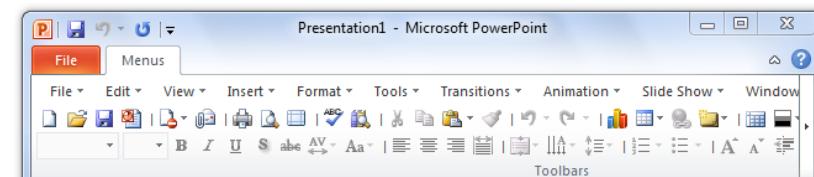
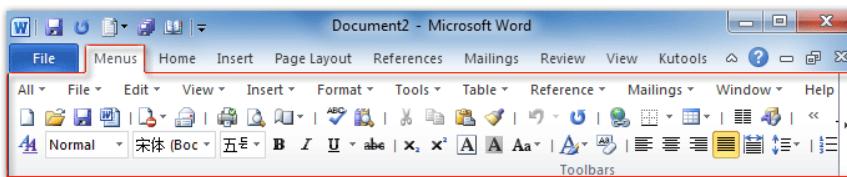
# Learnability - Generalizability

- Extending specific interaction knowledge to new situations
  - helps give a predictive model of system for user
  - a form of consistency
  - examples:
    - cut/copy/paste operations within Microsoft Office applications use of same short-cut keys.
    - UI standards and guidelines assist/enforce generalizability
      - applications should offer the Cut/Copy/Paste
      - operations whenever possible

Undo	Ctrl+Z
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Delete	Del
Search with Bing...	Ctrl+E
Find...	Ctrl+F
Find Next	F3
Replace...	Ctrl+H

# Learnability - Consistency

- Likeness in input/output behaviour arising from similar situations or task objectives
  - probably the most widely mentioned principle: “Be consistent!”
  - challenge (and danger): consistency not self-contained
    - consistency within screens
    - consistency within applications
    - consistency within desktop . . .
- Examples: consistent patterns in layout; same placement for recurrent menu options



# Visibility

- Is the state of the system visible?
- Relevant parts of a system should be visible
  - In real life, this is not an issue
  - Extra effort is needed in computer interfaces



The image shows a Microsoft PowerPoint slide titled "CS325 – attendance taking on moodle". The slide has a red border around the title area. Below the title, there is a screenshot of a Moodle attendance page with a red circle highlighting a button. To the right of the slide, there is a note: "Time window: 1:15pm – 1:45pm".

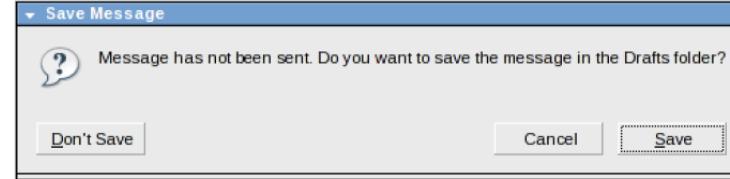
The slide is part of a presentation with three other slides:

- Slide 1: "CS325 – attendance taking on moodle" with a screenshot of a Moodle attendance page. A red circle highlights a button.
- Slide 2: "CS325 USER INTERFACE AND USER EXPERIENCE DESIGN Week 5" by Dr. Frank Guan.
- Slide 3: "Recap from last week"

On the right side of the slide, there is a note: "Click to add notes".

# Visibility – Make Actions Visible

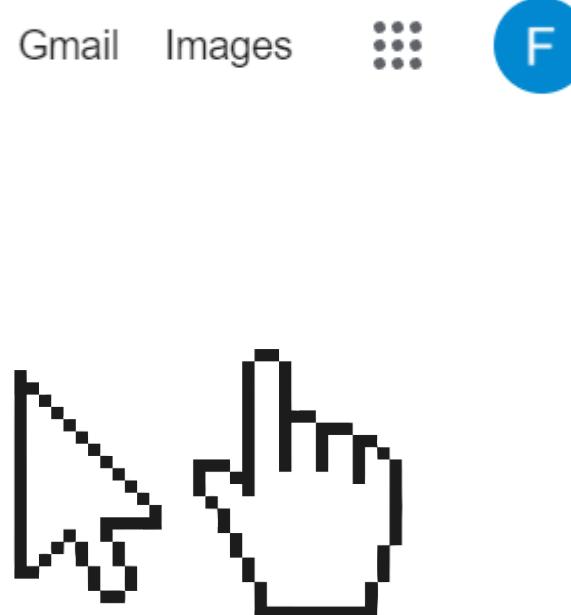
- Button & links



- Mouse cursor

- Highlight on mouseover

- ...



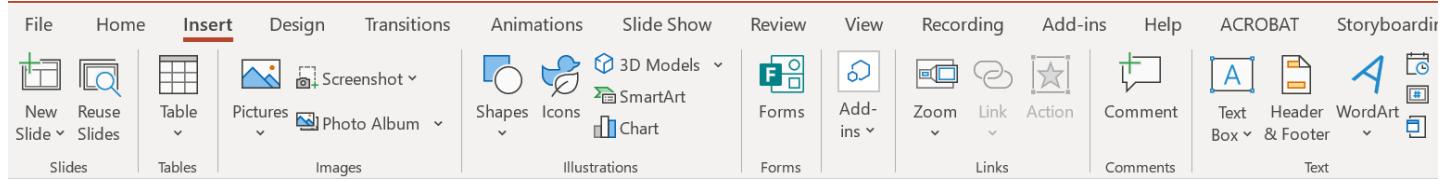
Gmail Images



F

# Visibility – Make Commands Visible

- Menus



- Tooltips

Tooltips Further Description ...

This is some text with an [inline tooltip](#) and an info icon behind. ?

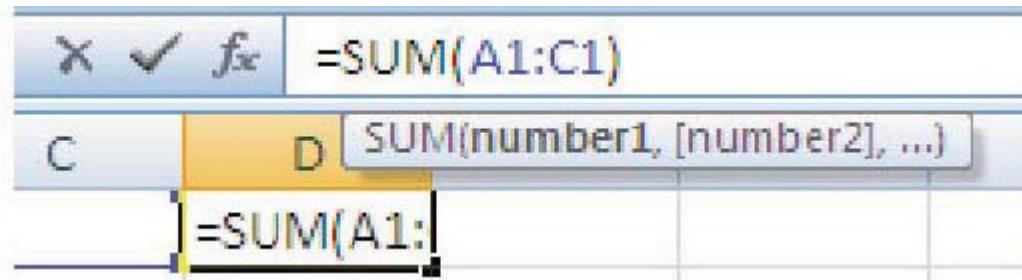
Tooltips Your very tooltiptext

This is some text with an [inline tooltip](#) and an info icon behind. ?

- Self-disclosure

In Bearbeitung:	<input checked="" type="checkbox"/> <span style="color: blue;">?</span>
Veraltet:	<input type="checkbox"/> <span style="color: blue;">?</span>
Vollständigkeit:	<span style="border: 1px solid black; border-radius: 5px; padding: 2px;">Vollständigkeit der Seite. Wird automatisch bestimmt.</span> <span style="color: blue;">?</span>

- ...



# Visibility – Make Navigation Visible

- Breadcrumbs

cs325f21-a.sg

Dashboard / My courses / cs325f21-a.sg / General / Announcements

- Pagination



- Tabs



# Visibility – Make Model State Visible

- Continuous visual representation of model
  - What to visualize should be guided by the user's tasks

# Efficiency

- Once users have learned the design, how quickly can they perform tasks?
- Examples
  - Put targets used together near each other for mouse efficiency
  - Use shortcuts for keyboard efficiency
  - Aggregate command and questions
  - Use defaults and history

(Very) Basic Keyboard Shortcuts	
Ctrl + X	Cut
Ctrl + C	Copy
Ctrl + V	Paste
Ctrl + Z	Undo
Ctrl + Y	Redo
Ctrl + B	Bold
Ctrl + I	Italics
Ctrl + S	Save
F12	Save As

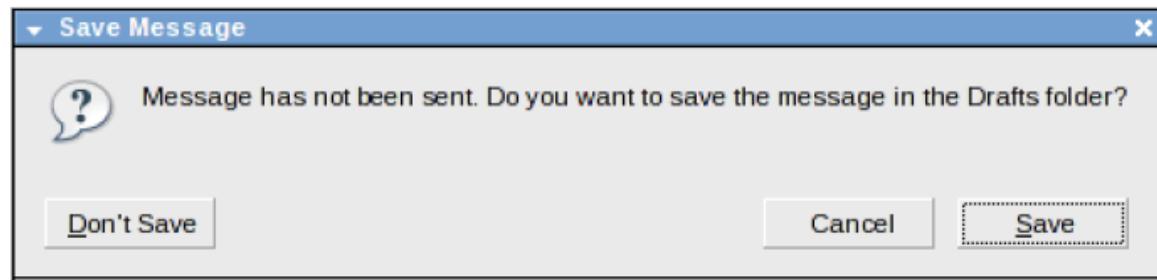


# Flexibility

- Flexibility extends the way a user and the system exchange information.
- Principles affecting flexibility:
  - Dialog Initiative
  - Multithreading
  - Task migrability
  - Substitutivity
  - Customizability

# Flexibility - Dialog Initiative

- Freedom from system imposed constraints on input dialogue
  - User VS System: who has the initiative in the dialog?
- Type 1: System pre-emptive
  - system does all prompts, user responds
    - modal dialog boxes are system pre-emptive
    - Eg. Bank machine
- Type 2: User pre-emptive
  - user initiates actions
    - more flexible



# Flexibility - Multithreading

- Multi-threading — support simultaneous tasks
- Two types
  - Concurrent
    - input to multiple tasks simultaneously
  - Interleaved
    - many tasks, but input to one task at a time



# Flexibility - Task migratability

- How easily functions can be moved between user and system
- Ability to move performance of task to entity (machine or person) that can do it better
  - Eg.
    - Autopilot
    - Spellchecking

## **People** are better at:

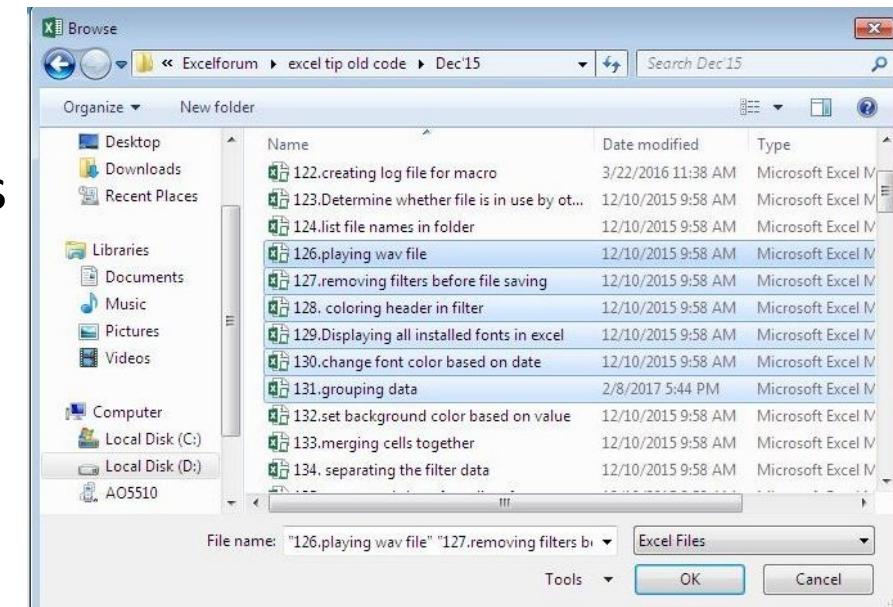
- Detecting small sensory inputs
- Improvising and using flexible procedures
- Reasoning inductively
- Selective information recall
- Exercising judgement

## **Machines** are better at:

- Responding quickly to signals
- Following procedures repeatedly and precisely
- Reasoning deductively
- Total information recall
- Following orders

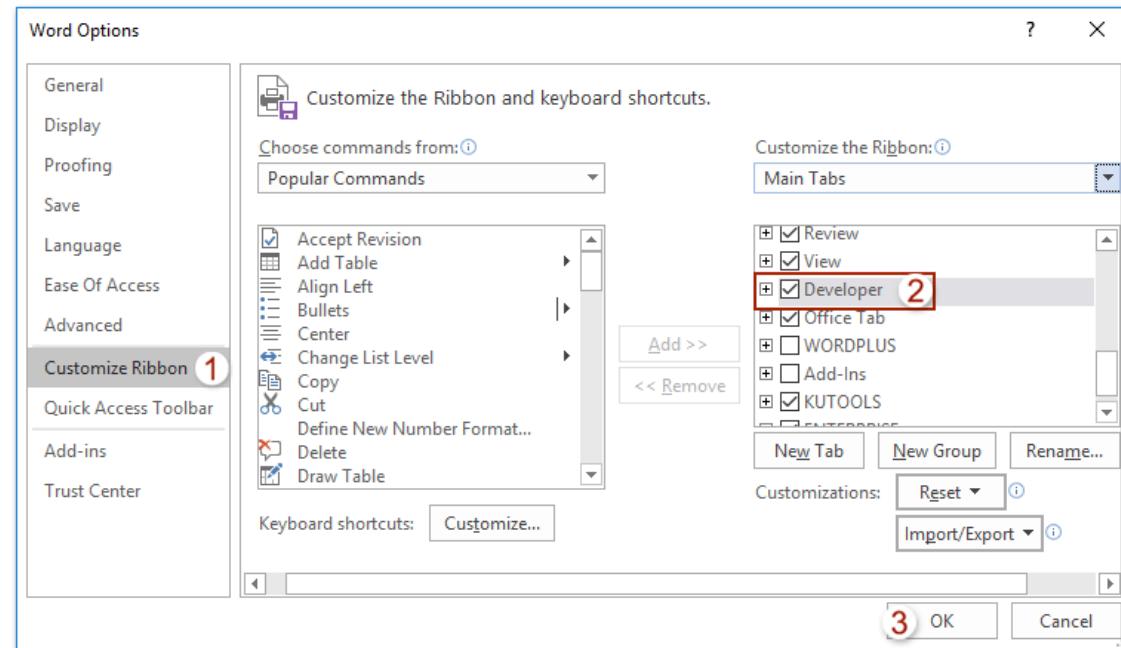
# Flexibility - Substitutivity

- Allowing equivalent values of input and output to be substituted for each other
- Flexibility in details of operations
  - Allow user to choose suitable interaction methods
  - Allow different ways to
    - perform actions
    - specify data
    - configure
  - Allow different ways of presenting output
    - to suit task, user



# Flexibility - Customizability

- Interface can be adapted to suit different needs
- Modifiability of the user interface by user (adaptability) or system (adaptivity)
  - provide choice of methods; allow short-cuts; permit users to change features: deferred design.



# UI Design: Guidelines

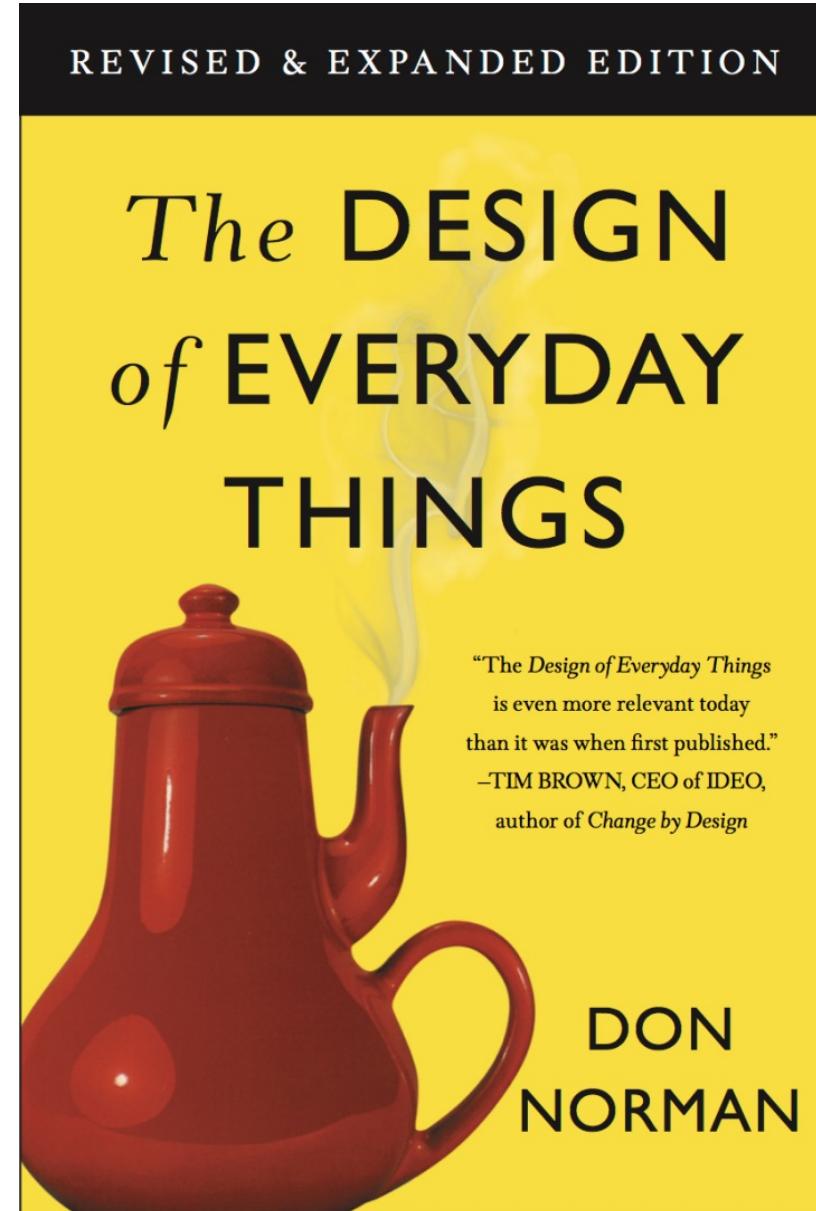
# Guidelines

- General guidelines (rules of thumb) to help create more usable systems
- Useful checklist for good design
- Better design using these than using nothing!
- Different collections e.g.:
  - **Norman's Principles (6)**
  - **Shneiderman's Golden Rules (8)**
  - Nielsen's Heuristics (10)

# Norman's Principles

# Classic Text

Don Norman, *The Design of Everyday Things* (Revised Edition), Basic Books, 2013



# Don Norman

Nielsen Norman Group  
UCSD Professor of  
Cognitive Science  
Formerly at Apple, HP, etc.



# Metaphor and Gulf of Execution & Evaluation

# Metaphor

- Something used, or regarded as being used, to represent something else (dictionary definition)
- Transfer of a relationship between a set of objects to another set of objects in a different domain
- Visuals, actions and procedures that exploit specific knowledge that users already have of other domains
- Gives the user instantaneous knowledge about how to interact with the UI

Office/Desktop



Folders/Files

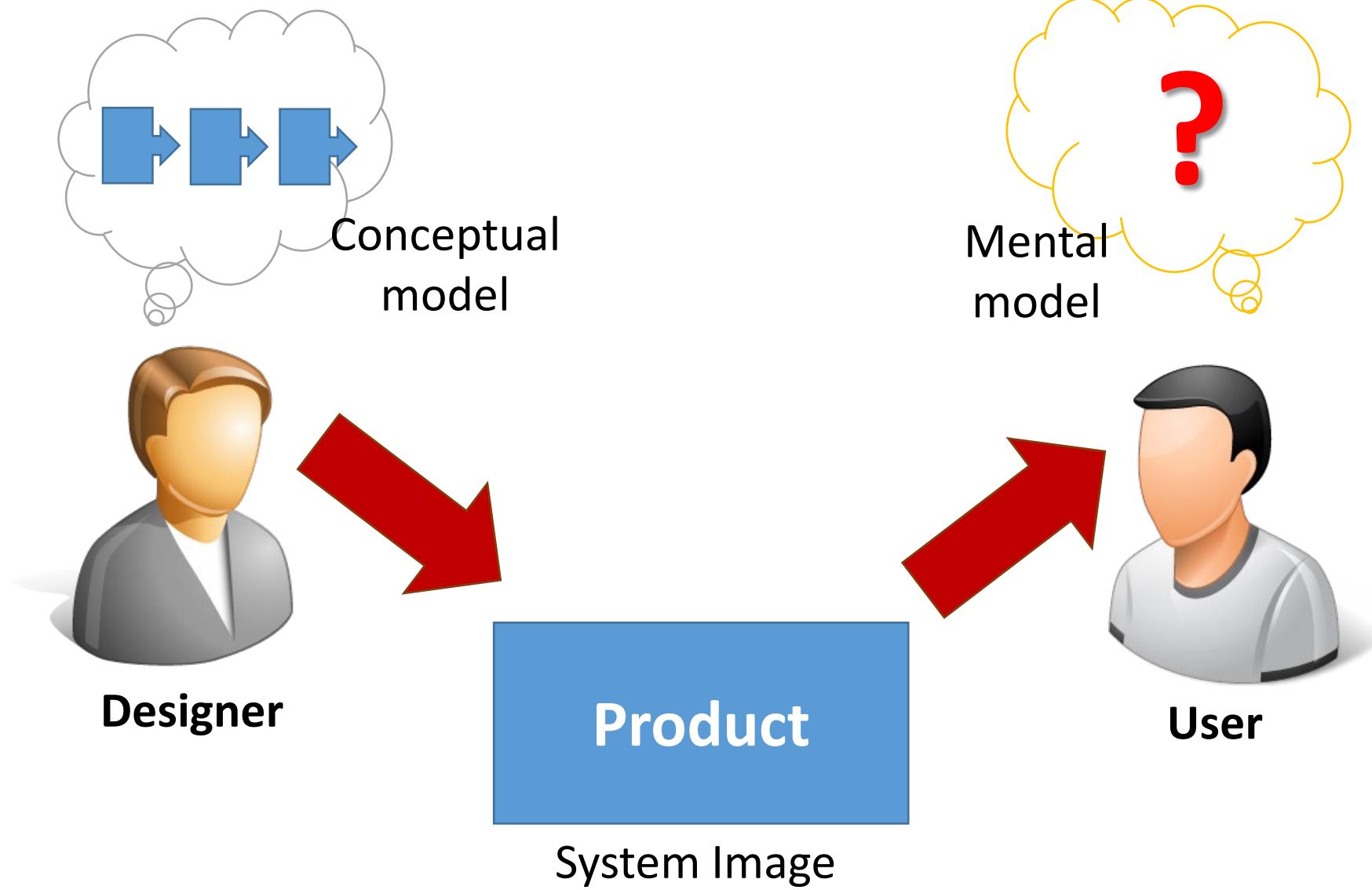


OS X Desktop

# Conceptual Model vs. Mental Model

- Conceptual Model: Simplified “explanation” or framework for understanding how something works. Formal, structured, logical
- System Image: Information conveyed by the product
- Mental Model: Models people have of themselves, others, the environment, and the things they interact with. Informal, incomplete, sometimes erroneous

# System Image





COLD



FREEZER



COLDER

SCROLL DOWN FOR  
COOLING OFF

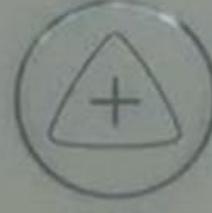
Recommended Settings: 4  
Coldest Settings: 7



COLD



REFRIGERATOR



COLDER





# Crossing the Gulf of Execution & Evaluation



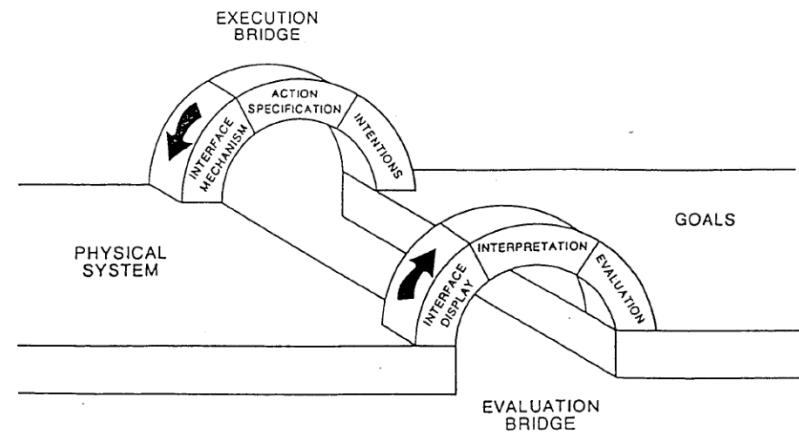
# Gulf of Evaluation & Execution

## Gulf of Execution

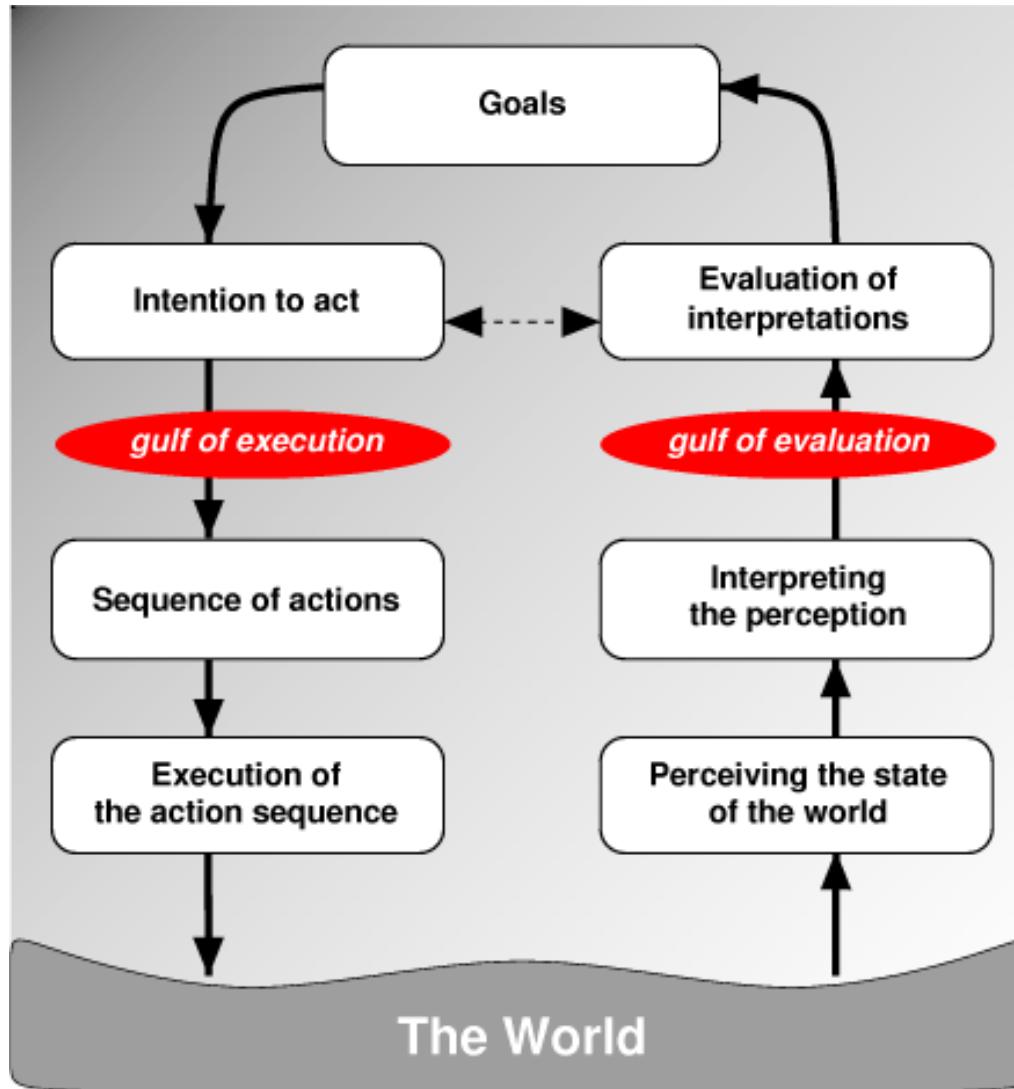
- “How do I know what I can do?”
- Amount of effort a person must exert to tell system what to do

## Gulf of Evaluation

- “How do I know what happened?”
- Amount of effort a person must exert to interpret the system



# Gulf of Execution & Evaluation





Hungry, want to eat noodles...

# Gulf of Execution

## **Forming the goal**

- Something to be achieved
- “want to eat noodles”

## **Forming the intention**

- Specifics of what has to be done to satisfy goal
- “reheat instant noodle in microwave”

## **Specify sequence of actions**

- Precise sequence of what has to be done to the system
- “Open door, place noodles in microwave, press button...”

## **Execution of action sequence**

- Actually doing the actions

# Gulf of Evaluation

## **Perceiving the state of the world**

- Experience what has actually happened
- Hear a beep, feel warmth, there's a smell

## **Interpreting the perceived state**

- Putting the perceptions together, make sense of them
- “beep comes from microwave, smell and heat comes from noodles”

## **Evaluation of interpretations**

- Compare what happened with what was wanted
- “noodles got heated, can start meal”

# Norman's Usability Principles

- Affordance
- Signifiers
- Visibility
- Mapping
- Feedback
- Constraints

# Affordance



# Affordance

Perceived (and actual) properties of an object or system that allows an individual to perform an action

The form, size and view of the object suggest what we can do with it

“Much of everyday knowledge resides in the world, not in the head” - Norman, 1988

# Affordance

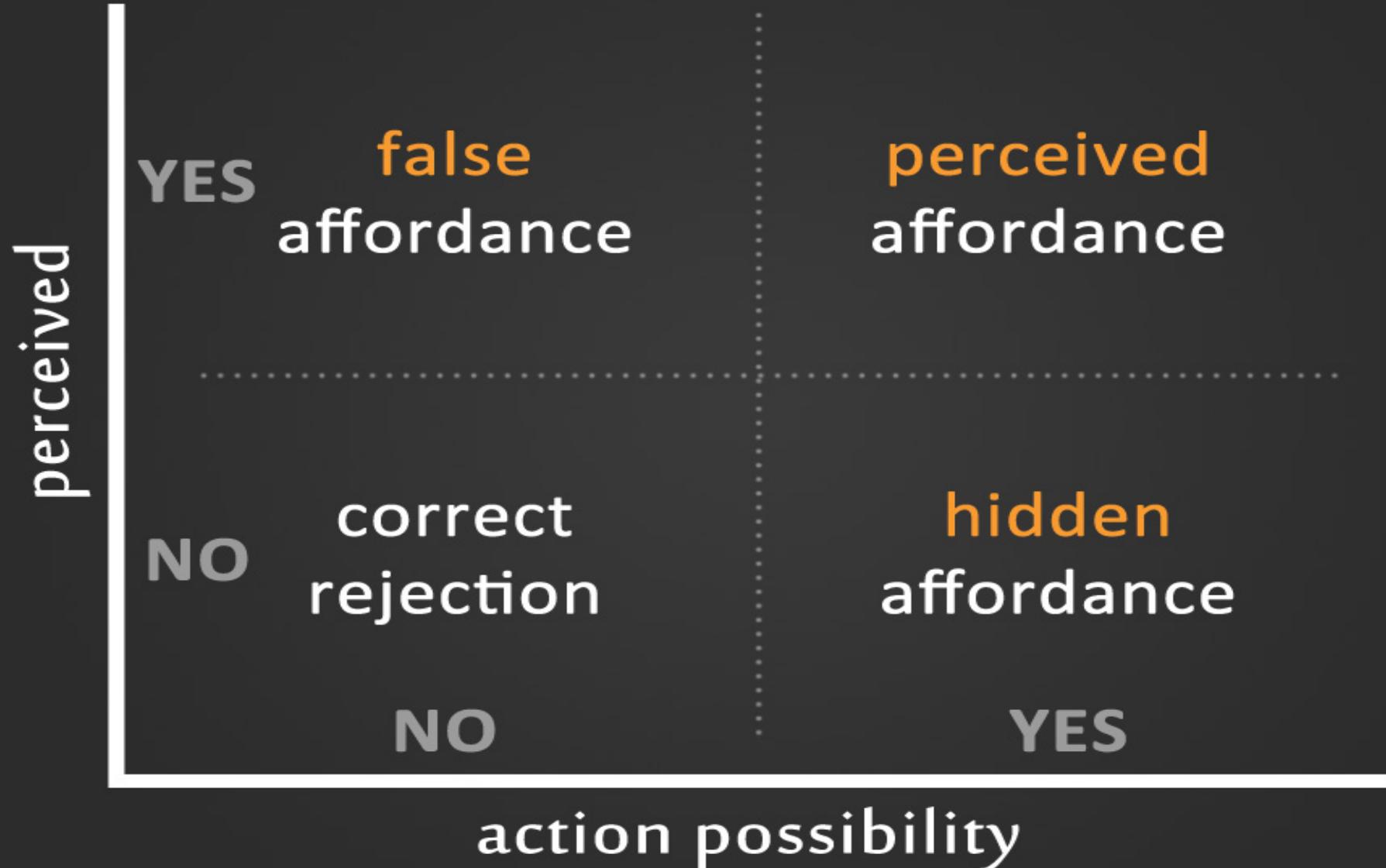
Handles on the teapot and cups provide affordance for holding



Ball affords throwing...



Chair affords sitting



# fleck

Daily, curated inspiration from a  
global community of artists,  
designers and makers

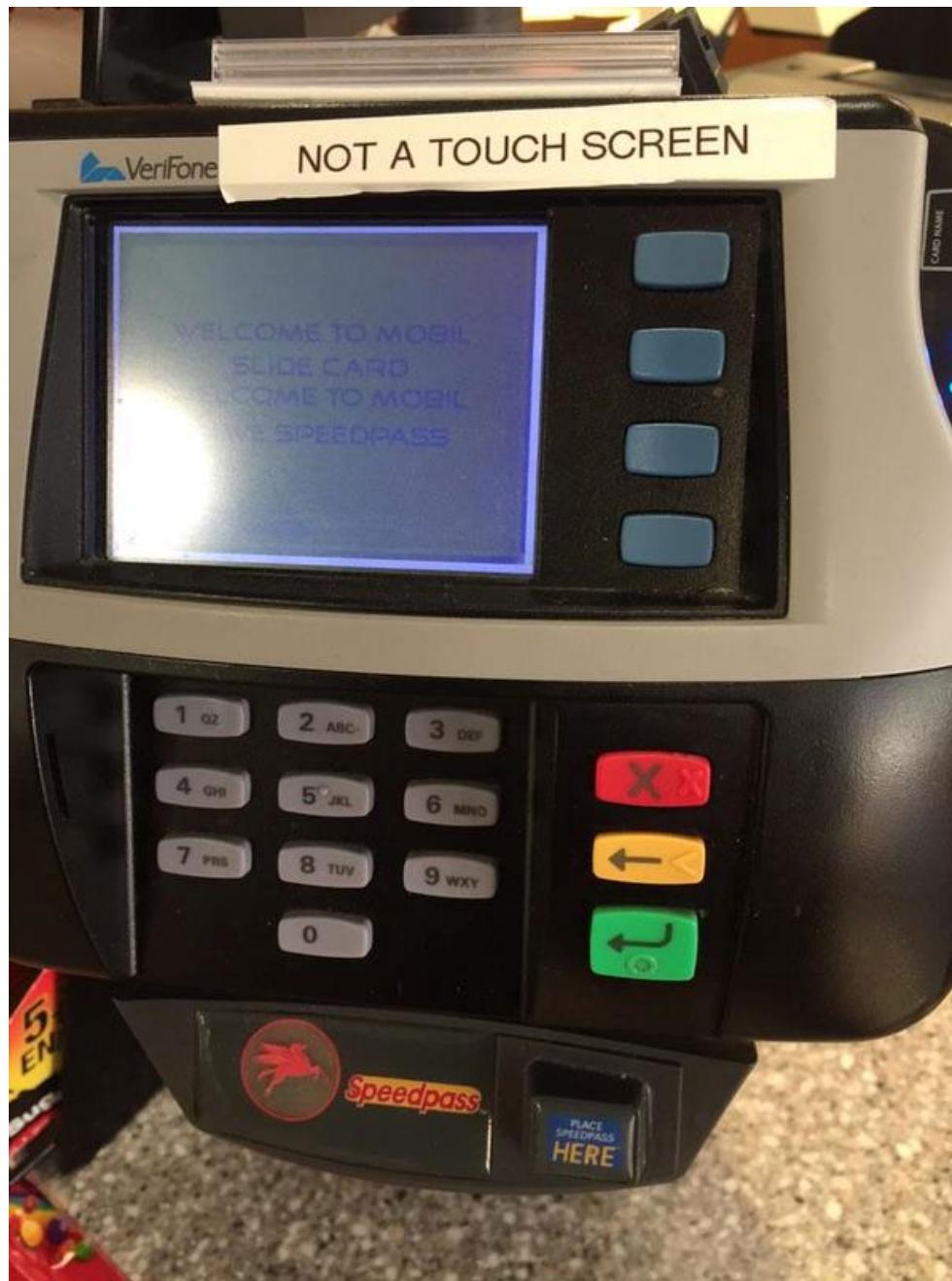


Sign in with Facebook



Sign in/up with Email

By using Fleck, you agree to our  
Terms of Use and Privacy Policy



# Signifier

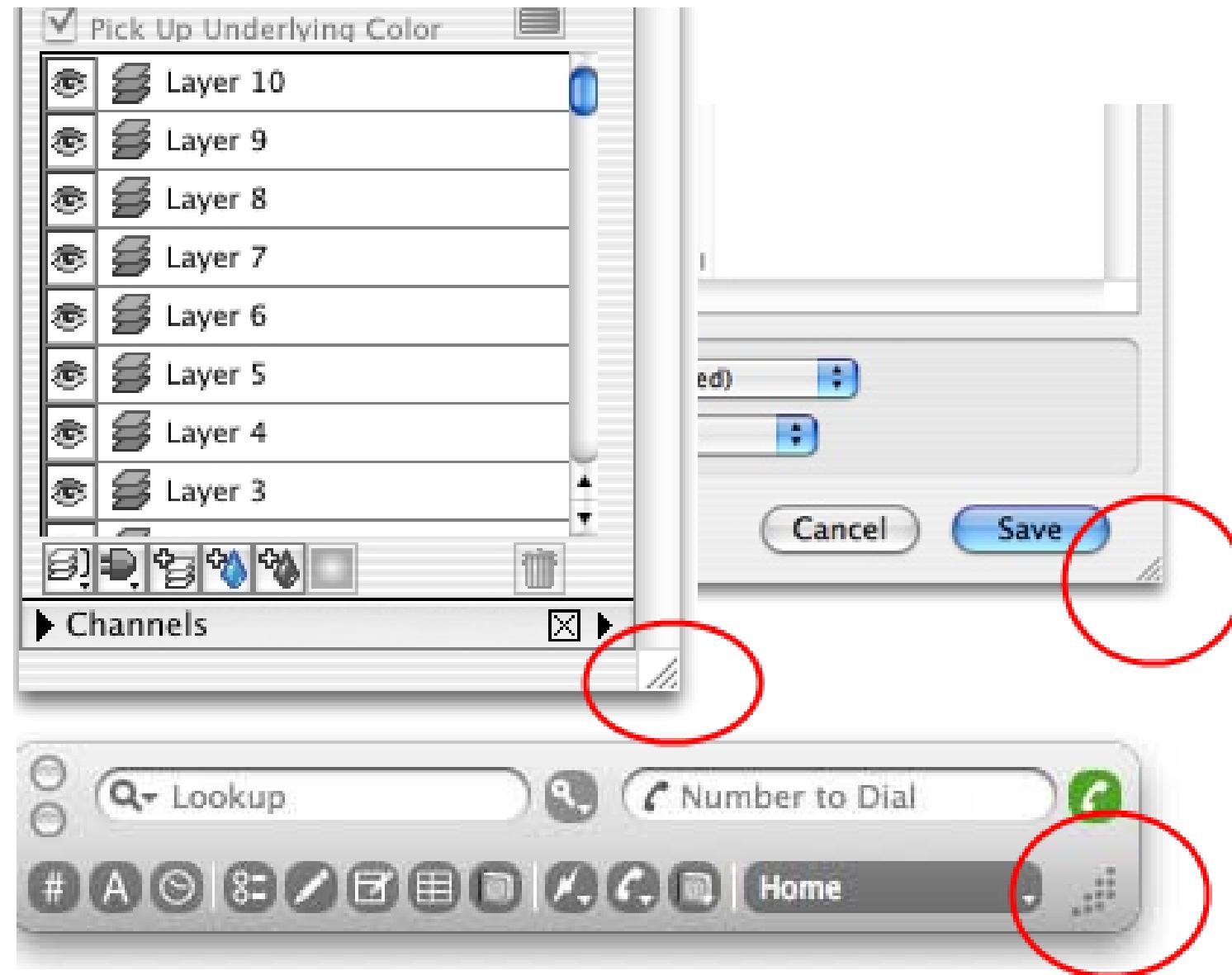
Signal or indication that communicates how to use the object

“I call any physically perceptible cue a signifier, whether it is incidental or deliberate.” - Norman

[https://www.jnd.org/dn.mss/signifiers\\_not\\_affordances.html](https://www.jnd.org/dn.mss/signifiers_not_affordances.html)

# Signifier

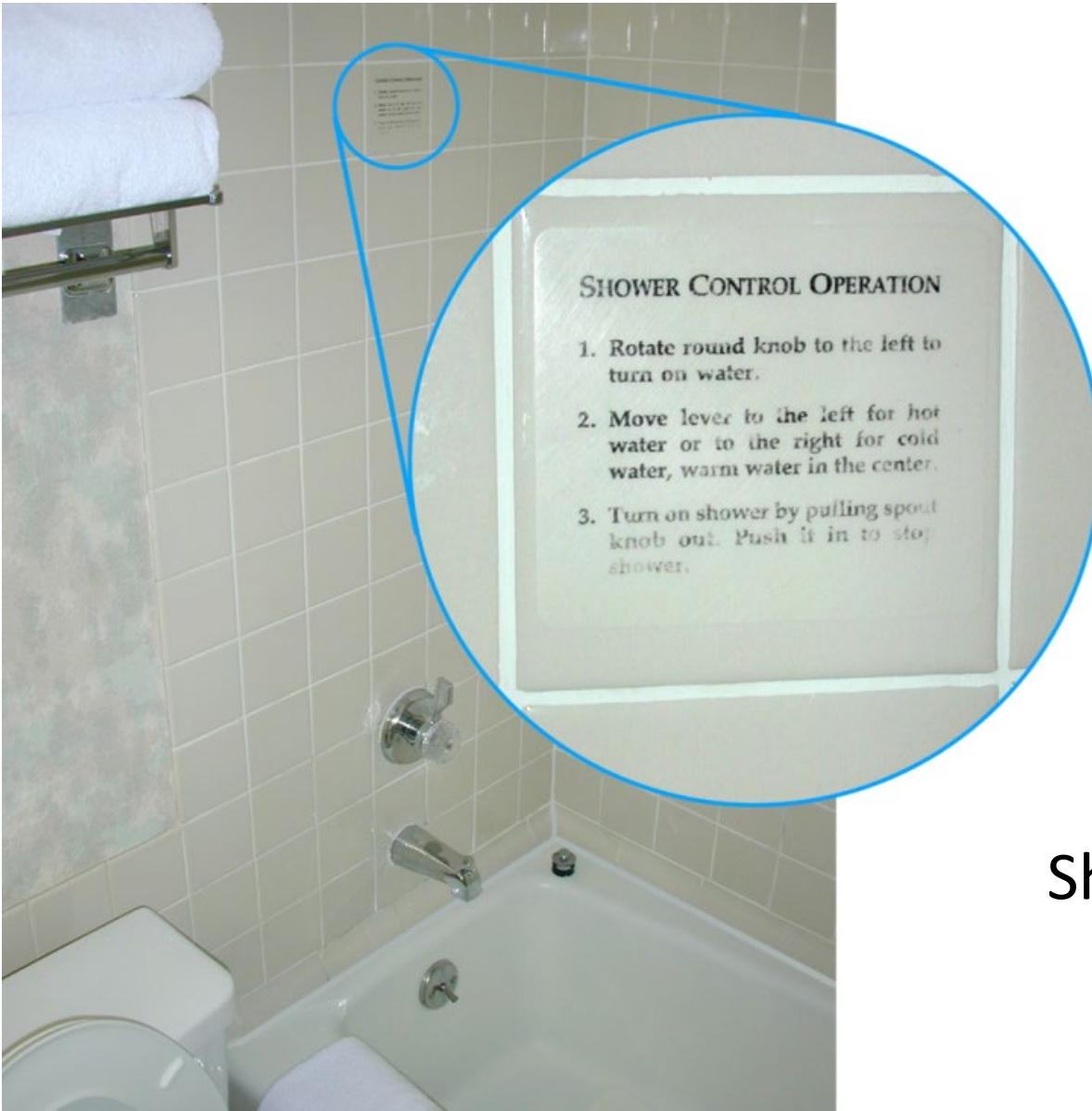




# Visibility

How easily the feature or capability of the object is seen

# Hotel Bathroom



[mindtheproduct.com](http://mindtheproduct.com)

Shouldn't need instructions on  
how to use the shower



How do you switch the water from tap to the shower head?

# Feedback

Send information back about what action has been done or accomplished

Indicate the result after an action

- Audio, visual, verbal, tactile, etc.

# Feedback

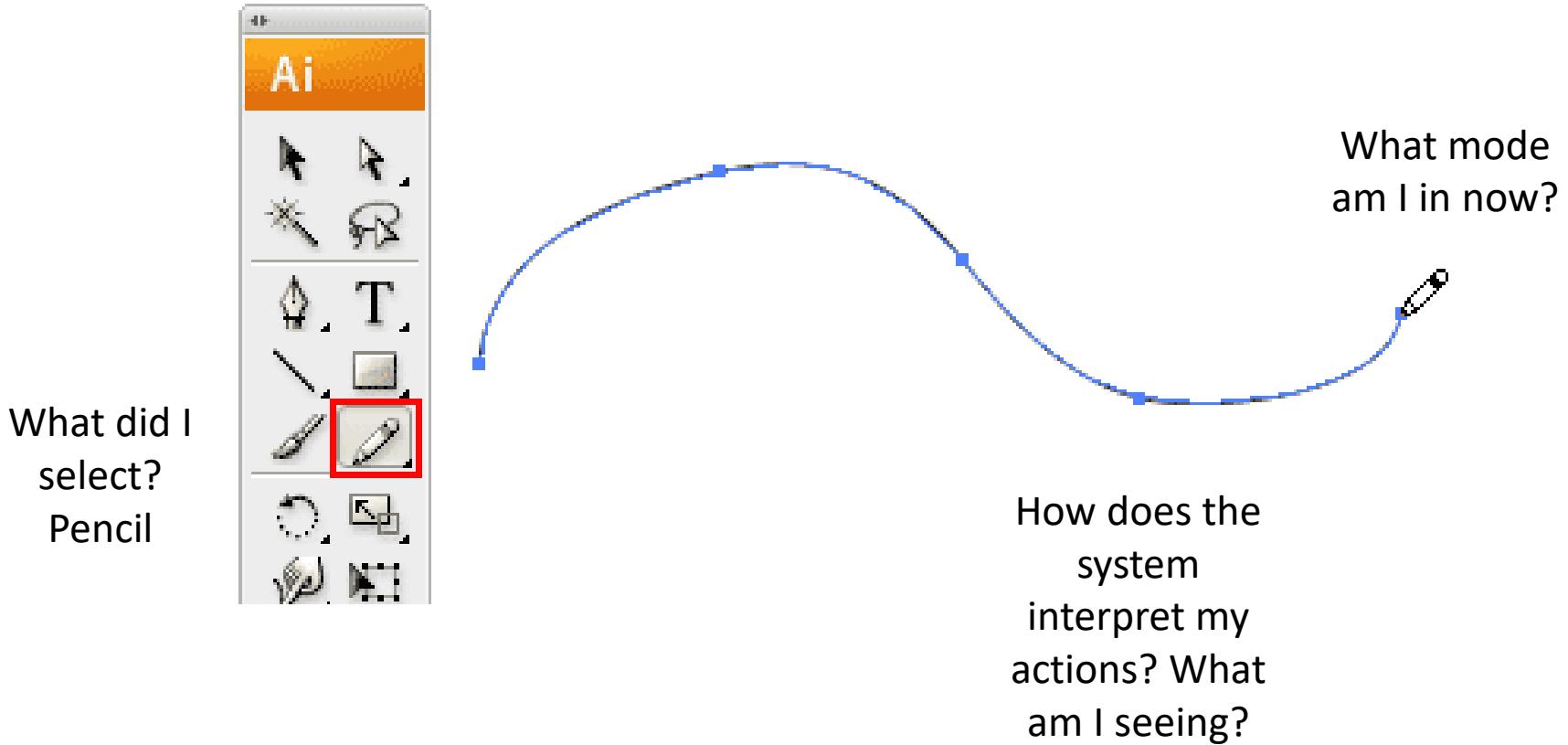


San Jose, CA



Singapore

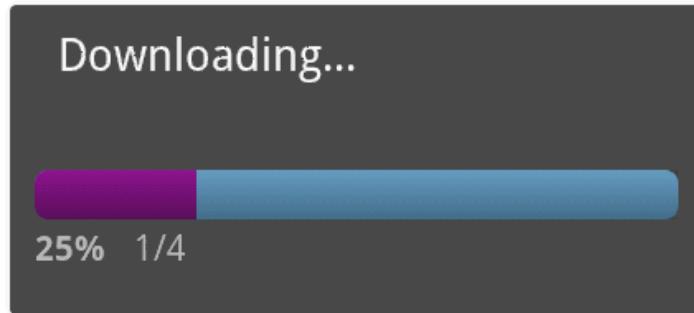
# Visibility & Feedback



# Feedback

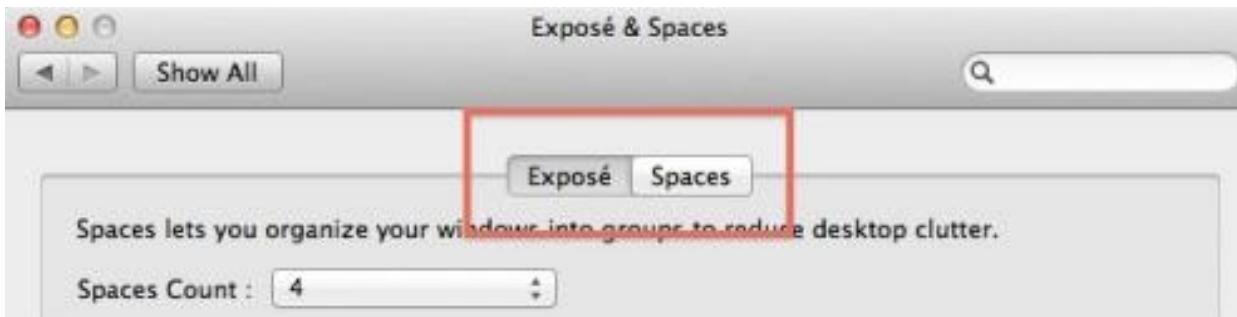


Cursors  
For short/moderate waits



Percent done dialog  
Estimated work left

Button/Slider  
Changes/depressed when selected



# Mapping

Relationship between the control and the action or result

# Mapping



Are the mappings apparent?



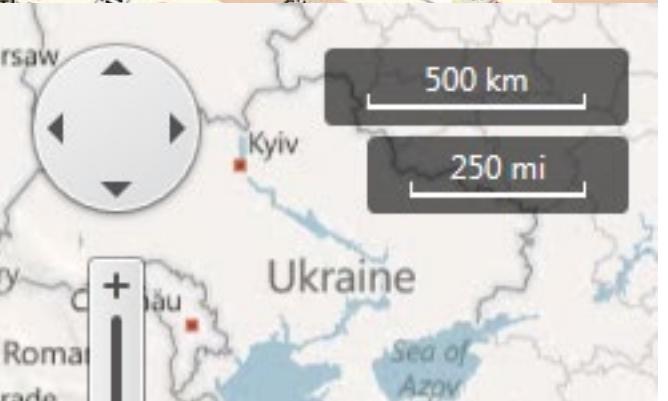
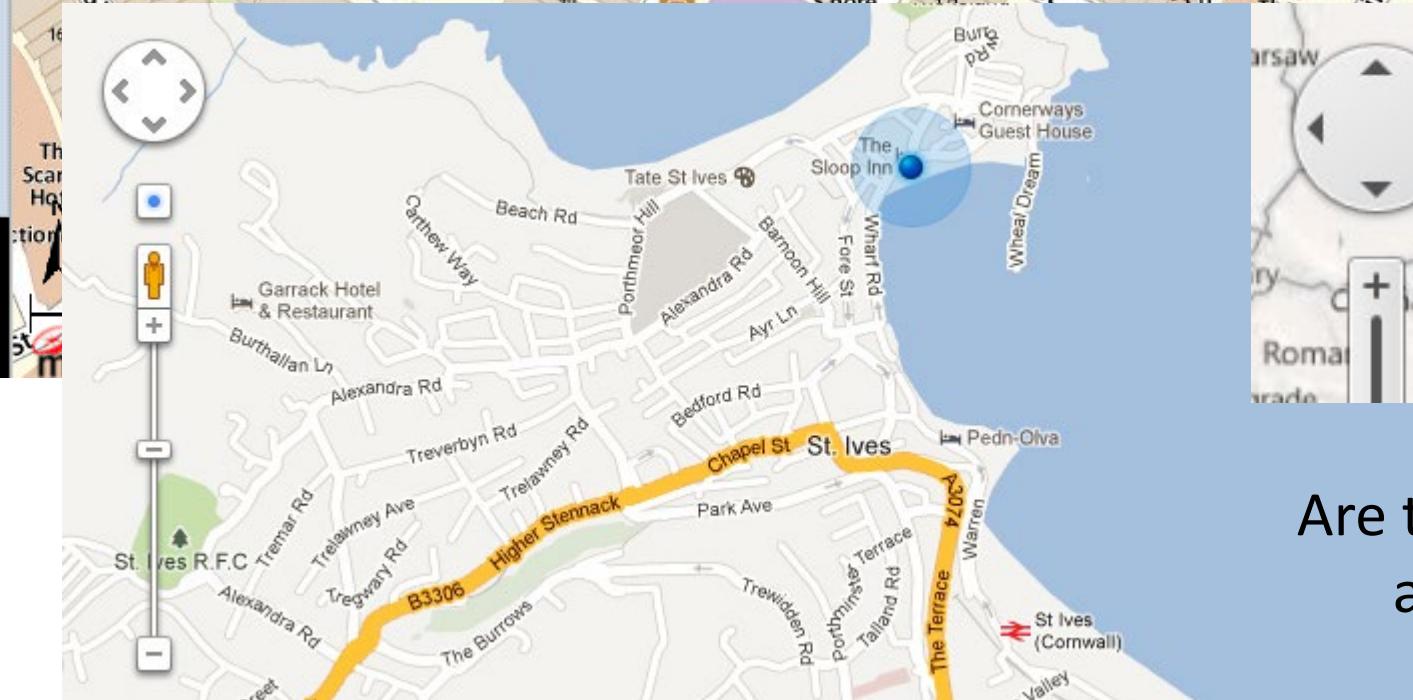
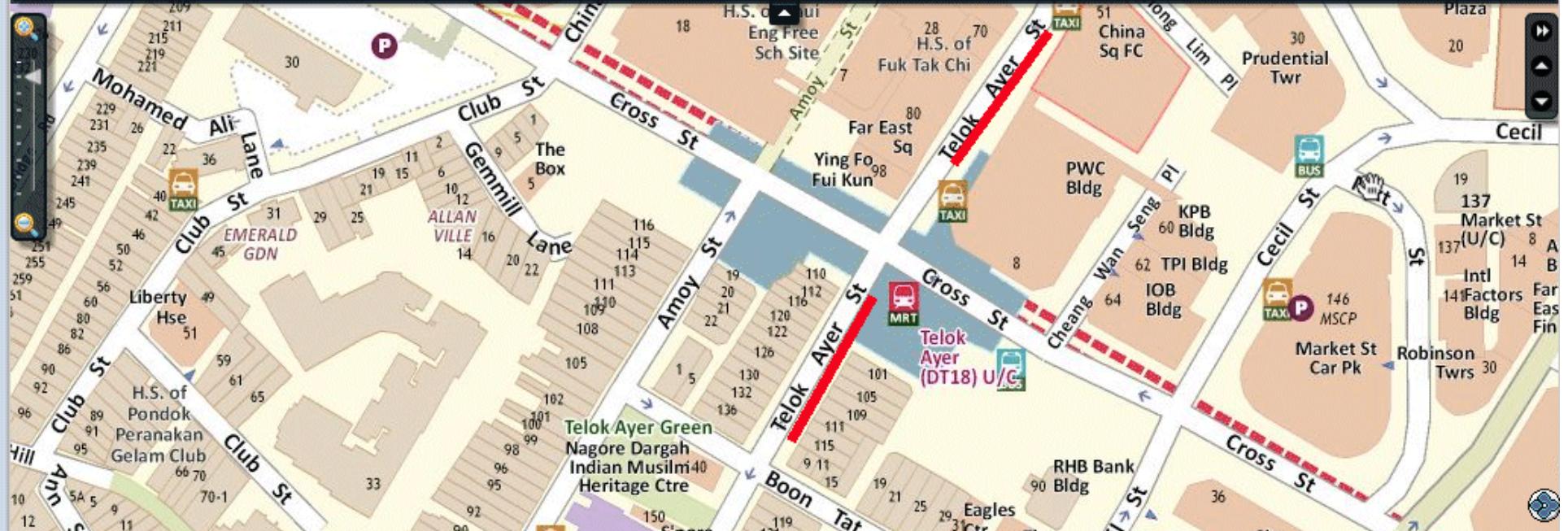
Are the mappings apparent?

2009 Hyundai  
Accent climate  
controls



Are the mappings apparent?

2011 Honda CR-Z  
climate controls

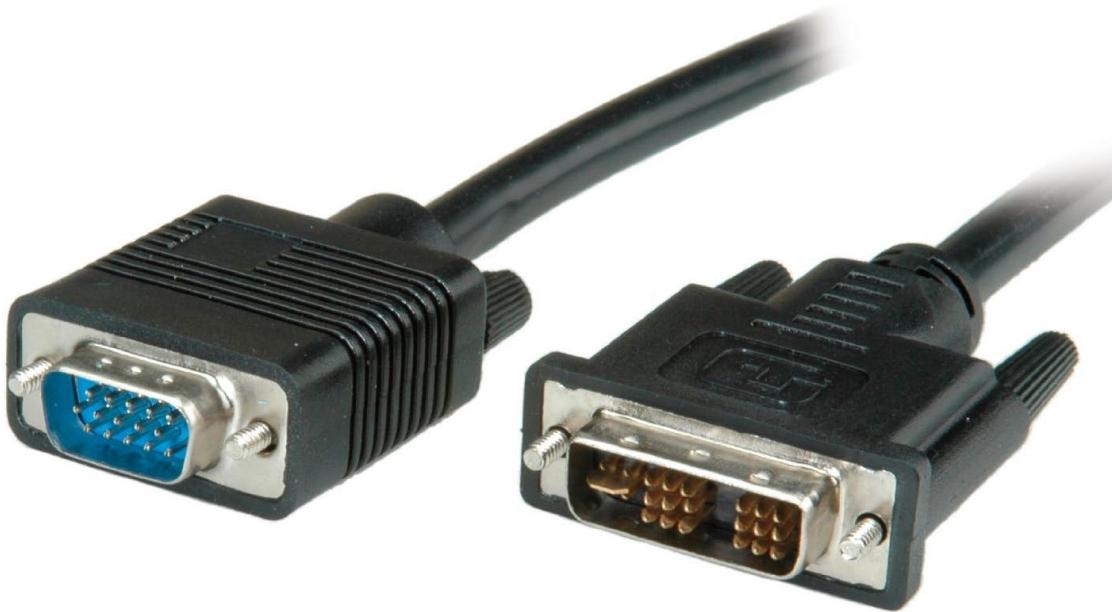


Are the mappings apparent?

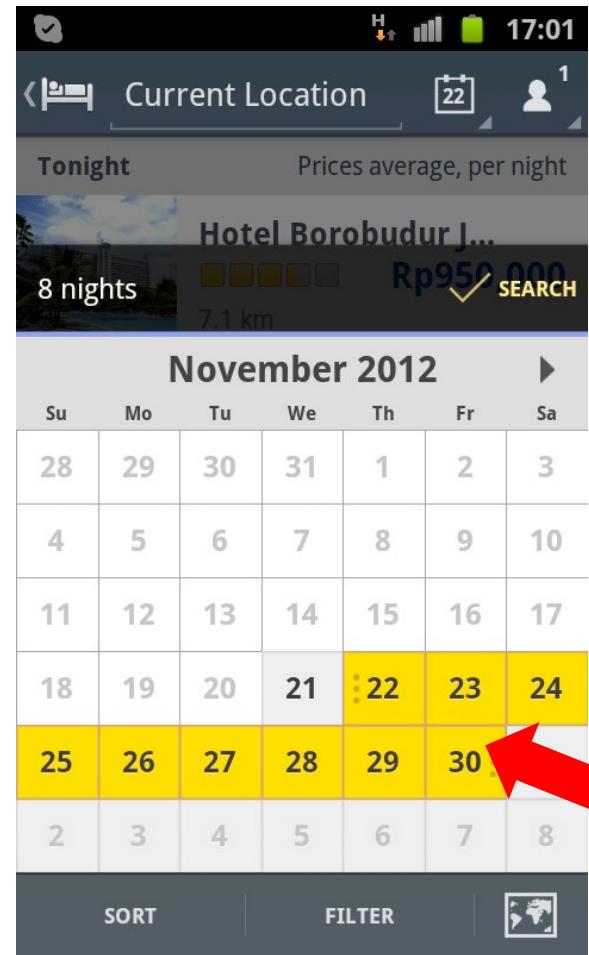
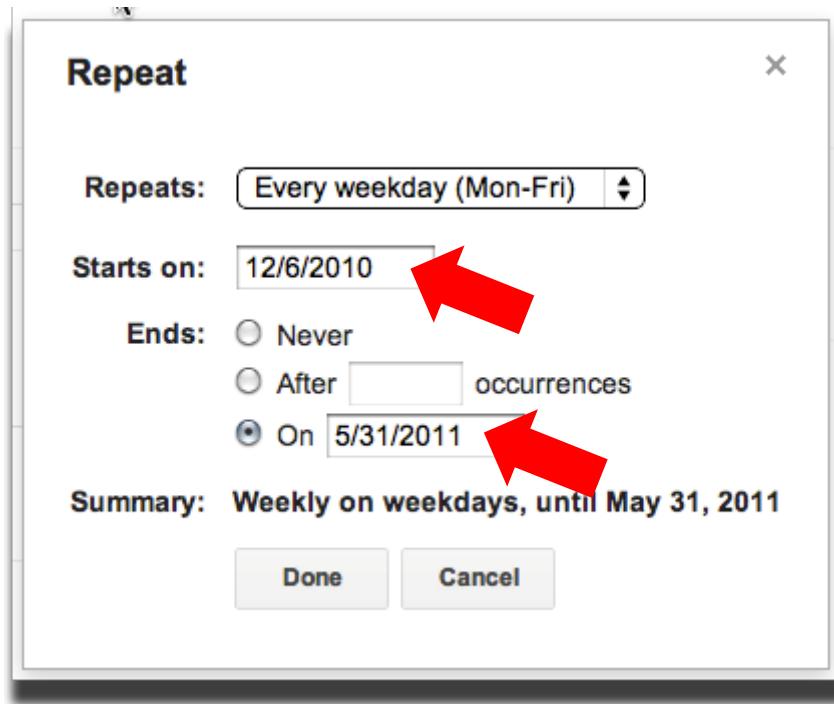
# Constraints

- Limits to the perceived operation of a device
- Constraints can be:
  - Physical
  - Semantic
  - Cultural
  - Logical

# Constraints



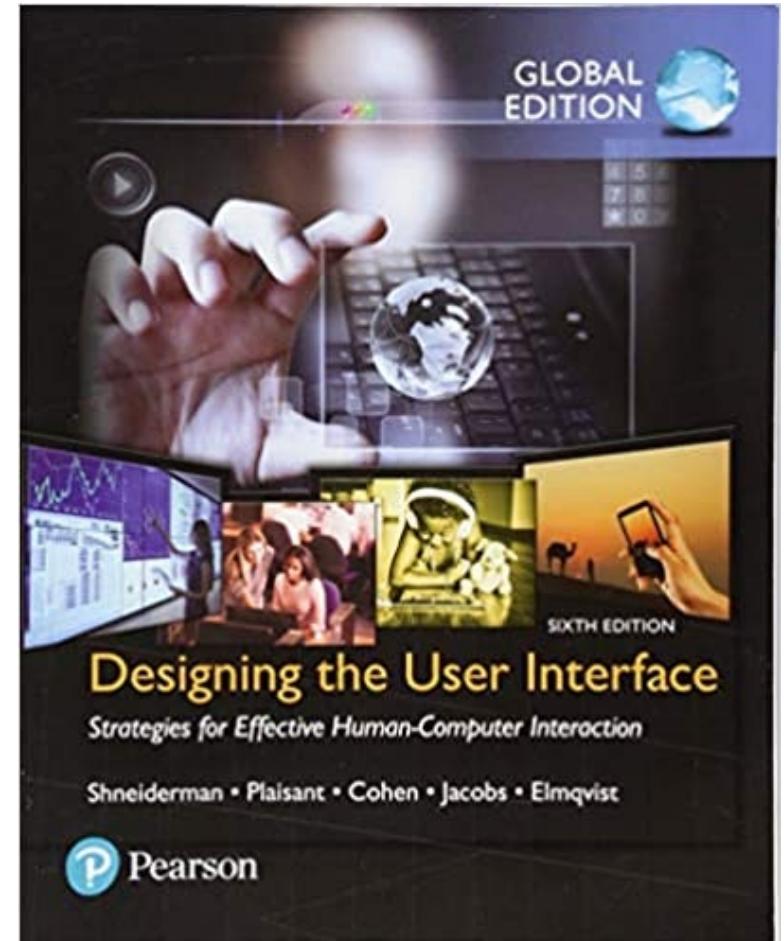
# Constraints



# Shneiderman's Golden Rules (8)

# Shneiderman's 8 Golden Rules

- Use simple and natural dialog in user's language
- Strive for consistency
- Provide informative feedback
- Minimize user's memory load
- Permit easy reversal of actions
- Provide clearly marked exits
- Provide shortcuts
- Support internal locus of control

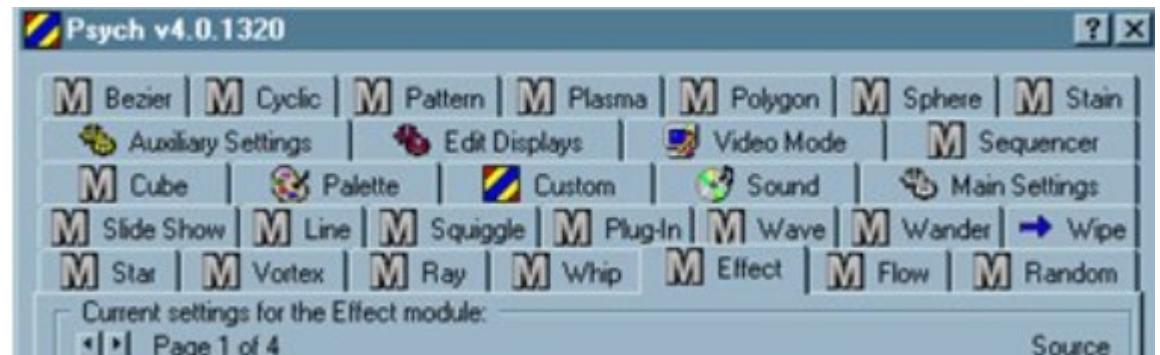


## 1. Use simple and natural dialog in user's language

- Match user's task in a natural way
- Avoid jargon, techno-speak

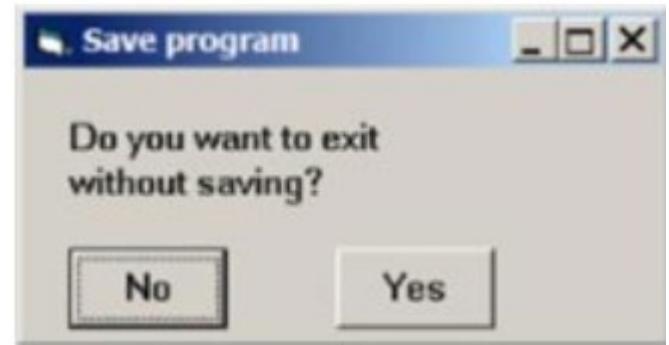
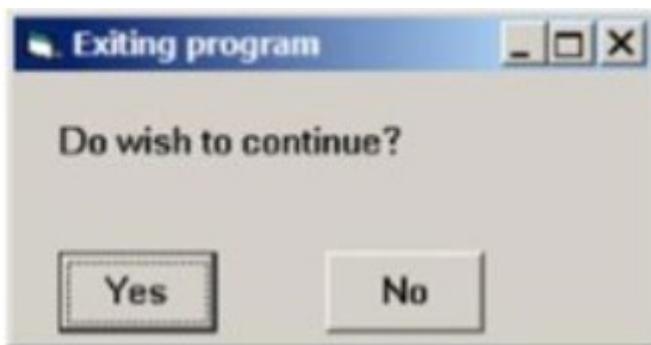
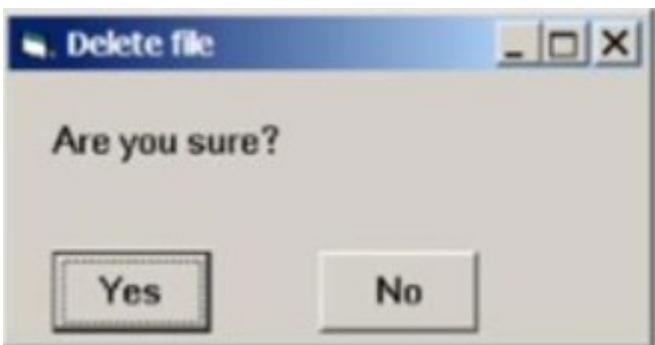


- Present exactly info that user needs
  - **Less is more!**



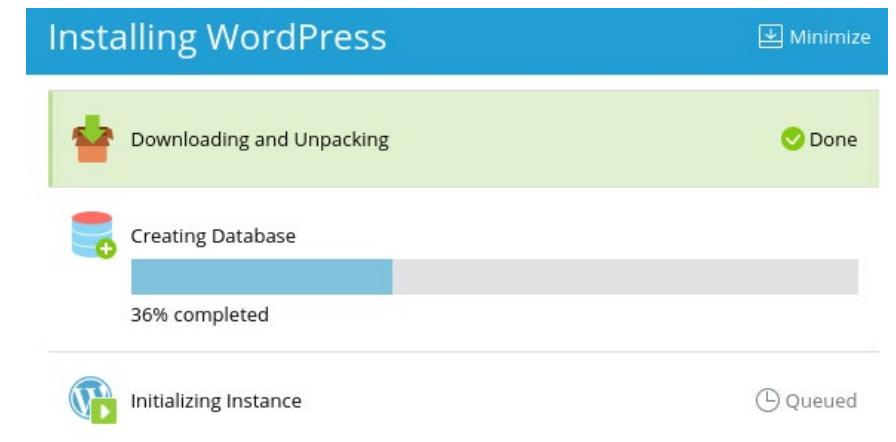
## 2. Strive for consistency

- Sequences, actions, commands, layout, terminology
- Makes more predictable
- Dialog boxes all having same “closure” options



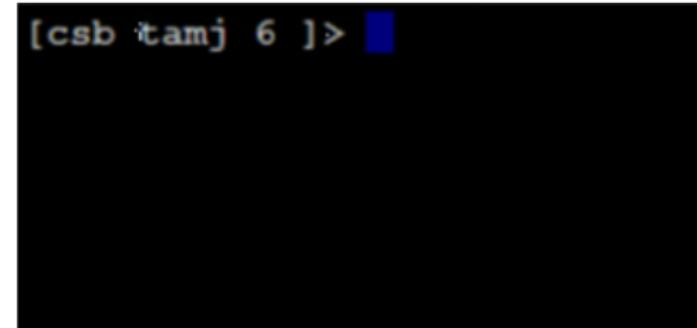
### 3. Provide informative feedback

- Continuously inform user about what is occurring
- Most important on frequent, substantive actions
  - % in file
- How to deal with delays?
  - Special cursors
  - % Done graphs



## 4. Minimize user's memory load

- Recognition is better than recall
  - Make visible!

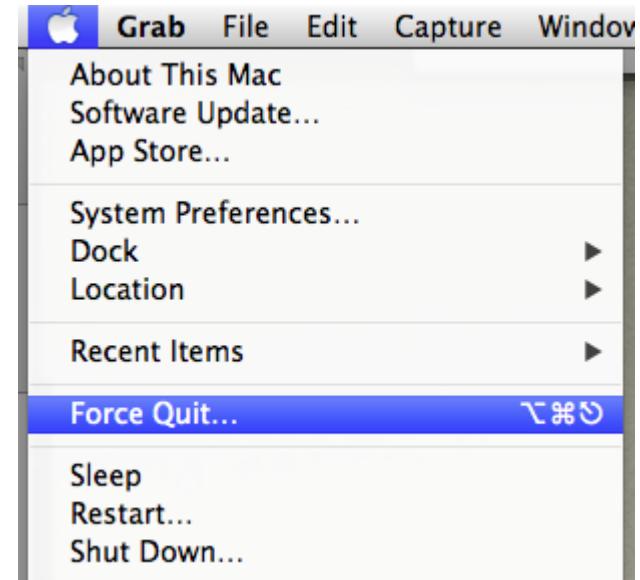


## 5. Permit easy reversal of actions

- Undo!
- Reduces anxiety, encourages experimentation

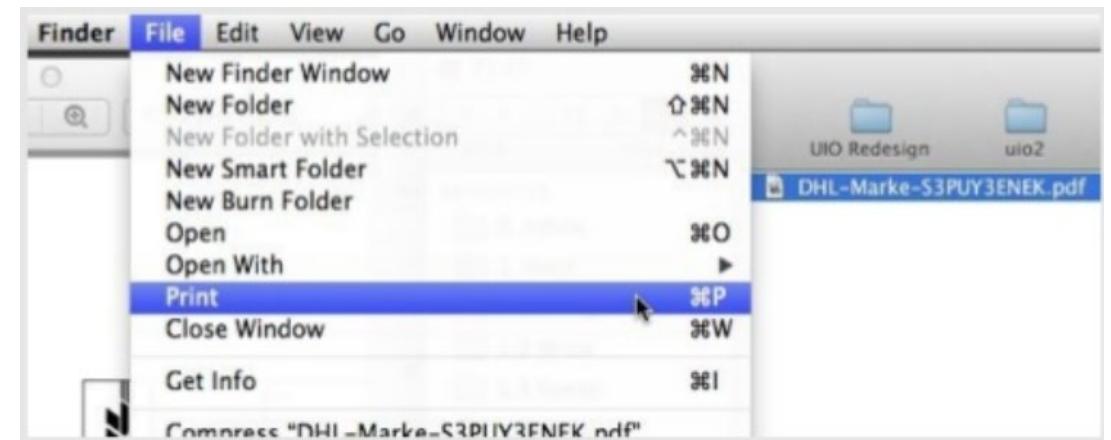
## 6. Provide clearly marked exits

- Don't want the user to feel trapped
- Examples
  - Cancel button on dialogs
  - Quit any time
  - Interrupt/resume on lengthy operations



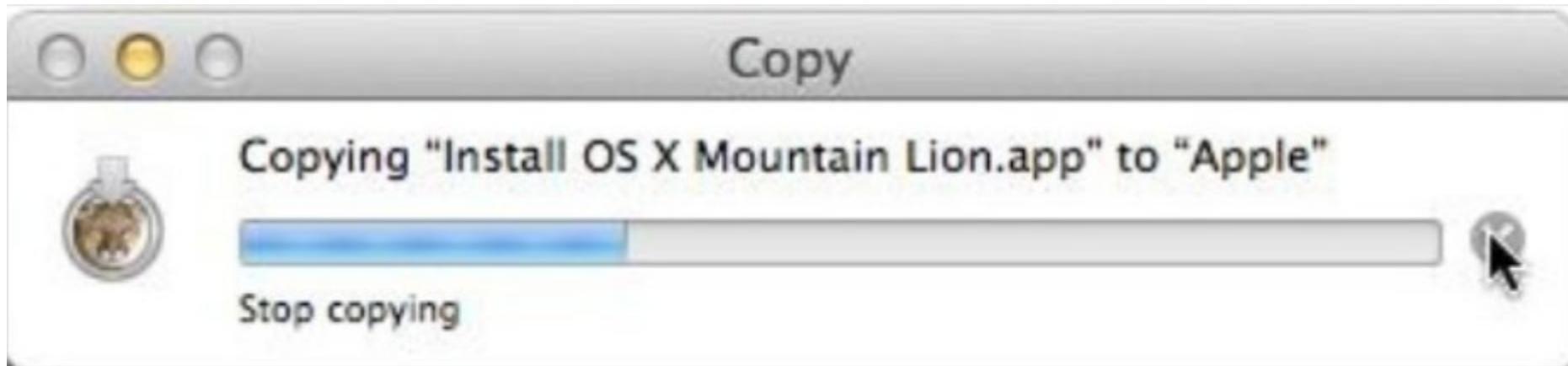
## 7. Provide shortcuts

- Enable frequent users to perform often-used operations quickly
  - Keyboard & mouse
    - Abbreviations
    - Menu shortcuts
    - Function keys
    - Command completion
    - Double click vs. menu selection
  - Navigation between windows/forms
  - Reuse
    - Provide a history system



## 8. Support internal locus of control

- Put user in charge, not computer
- Can be major source of anxiety



# Some other things to mention

- Pattern
- Standard

# Patterns

- An approach to reusing knowledge about successful design solutions. Originated in architecture (Alexander).
- A pattern is an invariant solution to a recurrent problem within a specific context.
  - Examples:
    - Light on Two Sides of Every Room (architecture)
    - Go back to a safe place (HCI)
- Patterns do not exist in isolation but are linked to other patterns in a pattern language which enables complete designs to be generated



design patt

design patterns

design patterns in java

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design patterns c

design patterns explained

design pattern factory

Auto-complete

# Standards

- Set by national or international bodies to ensure compliance by a large community of designers
- Standards require sound underlying theory and slowly changing technology
- Hardware standards more common than software high authority and low level of detail
- ISO 9241, Ergonomics of Human System Interaction, adopts traditional usability categories:
  - Effectiveness
    - can you achieve what you want to?
  - Efficiency
    - can you do it without wasting effort?
  - Satisfaction
    - do you enjoy the process?



# Example metrics from ISO 9241

<b>Usability objective</b>	<b>Effectiveness measures</b>	<b>Efficiency measures</b>	<b>Satisfaction measures</b>
Suitability for the task	Percentage of goals achieved	Time to complete a task	Rating scale for satisfaction
Appropriate for trained users	Number of power features used	Efficiency relative to expert user	Rating scale for ease of learning
Learnability	Percentage of functions learned	Time to learn criterion	Rating scale for ease of learning
Error tolerance	Percentage of errors corrected successfully	Time spent on correcting errors	Rating scale for error handling

# Summary

- Usability definition and dimensions
  - **Learnability**
  - **Visibility**
  - **Efficiency**
  - **Flexibility**
  - Errors and robustness
  - Memorability
  - Satisfaction
- UI design guidelines
  - Norman's Principles (6)
  - Shneiderman's Golden Rules (8)

# Administrative info

- Mid-term online exam
- Date: 13 Oct 2021 (Wed)
- Mode: close-book
- Time:
  - 1:30pm – 1:45pm (attendance taking and get prepared)
  - 1:45pm – 2:30pm (45 min exam)
- Questions
  - MCQ + open ended questions
- Scope
  - Lecture 1 – 5
- Note
  - Lecture will continue at 3:00pm